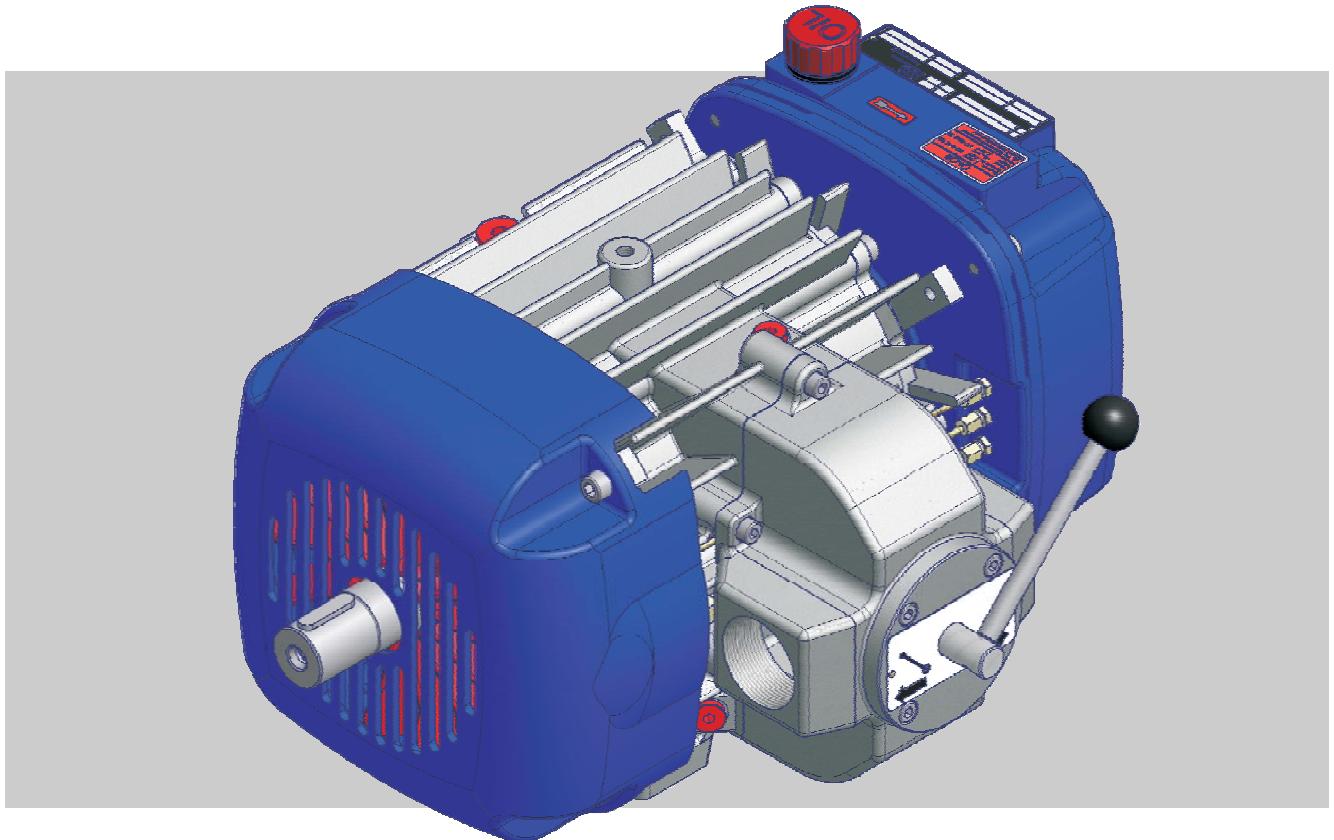




# Operating instructions

**VacuStar L400**  
**Multi-cell compressor vacuum pump**



Doc-ID: 5028-00/23.11.2010/BA/EN

Release: 11/2010

**Prior to installing the machine and putting it into operation you must have read and understood these operating instructions.**

# Translation of the Original Operating Instructions

© CVS engineering GmbH

Grossmattstraße 14  
79618 Rheinfelden / Germany

Phone: +49 (0)7623 71741-0  
Customer service: +49 (0)7623 71741-31  
E-mail: [info@cvs-engineering.de](mailto:info@cvs-engineering.de)  
Internet: [www.cvs-eng.de](http://www.cvs-eng.de)

Created by:  
alphatec Technische Dokumentationen  
Basler Str.  
79639 Grenzach-Wyhlen Deutschland  
[www.alphatec-dokumentation.de](http://www.alphatec-dokumentation.de)

<b>1</b>	<b>General</b>	<b>5</b>
1.1	Information regarding the operating instructions	5
1.2	Pictogram explanation	6
1.3	Limitation of Liability	7
1.4	Copyright protection	7
1.5	Spare parts	8
1.6	Warranty conditions	8
1.7	Customer Service	8
<b>2</b>	<b>Safety</b>	<b>9</b>
2.1	Intended use	9
2.2	Acceptance and monitoring	9
2.3	Operator's responsibility	9
2.4	Operating personnel	10
2.4.1	Requirements	10
2.5	Personal protective equipment	10
2.6	Occupational safety and special risks	11
<b>3</b>	<b>Technical data</b>	<b>16</b>
<b>4</b>	<b>Design and function</b>	<b>18</b>
4.1	Design	18
4.2	Function	19
4.3	Control and display elements	19
<b>5</b>	<b>Transport and storage</b>	<b>20</b>
5.1	Safety notes for transport	20
5.2	Transport	20
5.3	Storage	20
<b>6</b>	<b>Start-up and operation</b>	<b>21</b>
6.1	Safetynotes	21
6.2	Start-up	21
6.3	Switching off	22
6.4	Inspections to be performed	22
<b>7</b>	<b>Maintenance</b>	<b>24</b>
7.1	Safety during maintenance work	24
7.2	Maintenance schedule	24
7.3	Performance of maintenance work	25

<b>8</b>	<b>Malfunctions</b>	<b>27</b>
8.1	Safety	27
8.2	Recommissioning after corrective action	27
8.3	Malfunction table	28
<b>9</b>	<b>Spare parts</b>	<b>30</b>
<b>10</b>	<b>Decommissioning and disposal</b>	<b>30</b>
	<b>Index</b>	<b>31</b>

# 1 General

## 1.1 Information regarding the operating instructions

These operating instructions provide important information on how to deal with the machine. A precondition for safe operation is the observance of all specified safety and handling instructions.

Furthermore, all local accident prevention regulations and general safety regulations valid for the application area of the machine must be observed.

Carefully read the operating instructions before starting any work! It is a product component and must be kept in direct proximity of the machine, well accessible to the personnel at all times.

When passing the machine on to third parties, the operating instructions must also be handed over.

## General

### 1.2 Pictogram explanation

#### Warning notes

Warning notes are identified by icons in these operating instructions. The warning notes are marked by signal words expressing the extend of the hazard.

It is absolutely essential to observe the notes and to proceed with caution in order to prevent accidents as well as bodily injuries and property damage.



#### DANGER!

... points to an immediately dangerous situation, which can lead to death or serious injuries if it is not avoided.



#### WARNING!

... points to a potentially dangerous situation, which can lead to death or serious injuries if it is not avoided.



#### ATTENTION!

... points to a potentially dangerous situation, which can lead to minor or light injuries if it is not avoided.



#### CAUTION!

... points to a potentially dangerous situation, which may lead to property damage if it is not avoided.

#### Hints and recommendations



#### NOTE!

*... highlights useful hints and recommendations as well as information for an efficient and trouble-free operation.*

## 1.3 Limitation of Liability

All specifications and notes in these operating instructions were compiled with consideration to the valid standards and regulations, the state of the art as well as to our long-standing knowledge and experience.

The manufacturer is not liable for damages caused by:

- Non-observance of the operating instructions
- Improper use
- Deployment of non-trained personnel
- Arbitrary modifications
- Technical changes
- Use of non-approved spare and wear parts.

The actual scope of supply may differ from the explanations and illustrations described in this manual in case of special designs, if additional order options are made use of, or due to latest technical changes.

Incidentally, the responsibilities agreed upon in the delivery contract, the general terms and conditions as well as the manufacturer's conditions of delivery and the statutory provisions valid at the time of contract conclusion shall apply.

### Warranty

The manufacturer guarantees the correct functioning of the applied process technology and the performance parameters identified.

The warranty period commences on the date the machine is delivered to the customer.

Components are exempted from the warranty and from claims for defects as far as wear and tear damage is concerned.

## 1.4 Copyright protection



### NOTE!

*Content details, texts, drawings, pictures and other illustrations are protected by copyright and are subject to industrial property rights. Any improper use shall be liable to prosecution.*

Any type and form of duplication – also of extracts – as well as the exploitation and/or communication of the contents are not permitted without the manufacturer's written declaration of consent.

## 1.5 Spare parts



### **WARNING!**

#### **Risk of injury by incorrect spare parts!**

Incorrect or defective spare parts can result in damages, malfunctions or total failure and also impair safety.

Therefore:

- Use only the manufacturer's original spare parts.

Procure spare parts from authorised dealers or directly from the manufacturer. Refer to page 2 for address.

## 1.6 Warranty conditions

Warranty terms see "General Terms of Sale".

## 1.7 Customer Service

Our customer service can be contacted for any technical advice.

Information about the responsible contact person can be retrieved by telephone, fax, E-mail or via the Internet at any time, refer to manufacturer's address on page 2.

## 2 Safety

### 2.1 Intended use

The compressor vacuum pump VacuStar L400 is intended exclusively for the compression or suctioning of filtered air.

Only use machine for the intended use

All specifications in the operating instructions must be strictly adhered to (technical data, operating data, permissible working range), refer to Page 16, chapter 3 in this regard.

All types of claims due to damage arising from improper use are excluded. The operator alone shall be responsible for any damage arising from improper use.

### 2.2 Acceptance and monitoring

The compressor vacuum pump VacuStar L400 itself is not subject to any acceptance and monitoring obligation.

### 2.3 Operator's responsibility

The machine is used for industrial purposes.

The operator of the machine is therefore subject to the legal obligations concerning operational safety.

The provisions valid at the place of installation as well as the safety and accident prevention regulations of the Institution for statutory accident insurance and prevention must be observed. The operator must in particular:

- inform himself on the valid industrial safety regulations.
- determine the additional hazards that arise from the special working conditions at the machine's place of installation by means of a hazard assessment.
- implement the necessary rules of conduct for operation of the machine at the place of installation by means of user instructions.
- check at regular intervals during the machine's entire period of use whether the user instructions correspond to the current state of the body of rules and regulations.
- adapt the operating instructions – if necessary – to the new regulations, standards, and operating conditions.
- clearly regulate the responsibilities for installing, operating, maintaining and cleaning the device.
- ensure that all employees working on or with the machine have read and understood the operating instructions. In addition he must at regular intervals train the employees in how to deal with the machine and inform them about potential hazards.

## Safety

In addition, it is the operator's responsibility to ensure that:

- the machine is always in a technically perfect condition.
- the machine is maintained in accordance with specified maintenance intervals.
- all safety devices are regularly examined for completeness and operability.

## 2.4 Operating personnel

### 2.4.1 Requirements



**WARNING!**  
**Risk of injury in case of inadequate qualification!**

Improper handling can lead to considerable bodily injuries and property damage.

Therefore:

- Have any activities only carried out by the individuals designated for that purpose.

The operating instructions specify the following qualification requirements for the different fields of activity:

- **Instructed persons**  
 have been instructed during instructions provided by the operator with regard to the work assigned to them and possible hazards arising from improper conduct.
- **Specialised staff**  
 is due to its technical training, knowledge and experience as well as due to its knowledge of the pertinent regulations able to carry out the work assigned to it and to independently recognise potential hazards.

## 2.5 Personal protective equipment

When handling the machine, it is necessary to wear personal protective equipment, in order to minimise health hazards.

- Before carrying out any work, properly don the necessary protective equipment such as gloves, safety goggles, etc. and wear during work.

## 2.6 Occupational safety and special risks

The remaining risks, which result from the hazard analysis, are specified in the following section.

Observe the safety notes listed here and the warning notes in the other chapters of these instructions to reduce health hazards and to avoid dangerous situations.

### Danger pictograms on the device

The relevant dangerous spots on the machine are identified by these pictograms:



#### **DANGER!** General danger pictogram!

... denotes general dangerous situations for individuals. Non-observance of the safety instructions can result in severe injuries or death .



#### **DANGER!** Danger of burns!

... denotes the presence of a hot surface.

## Safety

### Hazard notes and occupational safety

For your own safety and that of the machine, the following information must be observed and complied with:

#### Improper operation



##### DANGER!

##### Danger due to improper operation!

- Only use machine in a perfect technical condition. Malfunctions that are relevant for safety have to be promptly eliminated.
- Conversions of the machine are not permissible and can impair safety.
- Never bridge any safety equipment or put it out of operation.
- Any work on the machine and/or on electrical equipment must be carried out by specialised staff.
- Repair and maintenance work may only be carried out when the machine is stationary. Secure the machine against restarting.
- The machine may not be under pressure or negative pressure while work is being carried out on it.  
Close shut-off vane on vehicle side and ventilate line between machine and shut-off vane or drain excess pressure manually from safety valve. Observe pressure gauge!
- The drive's protective equipment may only be removed when the machine is stationary and has to be correctly refitted after completion of work.
- Only dismantle accidental contact protection after machine and pipes have cooled down.
- It is an environmental protection requirement that any liquids arising during maintenance work (e.g. oil) must be collected and disposed of in an environmentally compatible manner

**Moving components****WARNING!****Risk of injury by moving components!**

Powered rotating components can cause the most serious injuries!

Therefore during operation:

- It is absolutely forbidden for persons to stay in the hazard area or in the immediate vicinity!
- Do not put safety devices and/or functions out of operation and do not render them inoperative or bypass them.
- Never reach into open outlets and inlets or into running equipment.

Before entering the hazard area:

- Switch off power supply and secure against re-starting.
- Wait for standstill of lagging components.
- Wait for automatic dissipation and/or discharge of residual energies (compressed air).

**Pneumatics****WARNING!****Risk of injury due to compressed air!**

Pneumatic energies can cause the most serious injuries.

In the case of damage to individual components, air can be discharged under high pressure and injure e.g. the eyes. Therefore:

- Before starting any work, first depressurise pressurised components. Pay attention to accumulators. Accumulator pressure must also be completely relieved.

**Signposting****WARNING!****Risk of injury by illegible pictograms!**

Labels and signs can become dirty or unrecognisable in the course of time.

Therefore:

- Always keep safety, warning and operating instructions in a well legible condition.
- Immediately replace damaged or obliterated signs or labels.

## Safety

### Improper transport



#### Danger!

#### Danger by falling down or tilting of the machine!

The weight of the machine may injure a person and cause serious bruising!

Therefore:

- Depending on the dead weight and size of the machine, use a pallet on which the machine can be moved by means of a fork lift.
- For lifting the machine, use suitable lifting gear (slings, etc.) that is designed for the weight of the machine.
- When putting the slings in position, take care to avoid putting stress on individual components.
- Only use attachment points with eye bolts provided for that purpose.

### Start-up and operation,



#### WARNING!

#### Risk of injury due to improper start-up and operation

Improper start-up and operation can lead to serious bodily injuries or property damage. Therefore:

- Have all work during initial operation exclusively performed by the manufacturer's employees or by his authorized representatives or by trained personnel.
- Start-up and operation may only be performed by adequately qualified personnel who have been authorized and instructed by the operator.
- Before the start of any work, ensure that all covers and protective devices are correctly installed and function correctly.
- Never override any protective equipment during operation.
- Pay attention to tidiness and cleanliness in the working area! Loosely stacked or scattered components and tools are accident sources.

**Maintenance and troubleshooting****WARNING!****Risk of injury due to improper maintenance and trouble shooting!**

Improper maintenance and trouble shooting can lead to serious bodily injuries or property damage. Therefore:

- Maintenance work and trouble shooting work may only be carried out by sufficiently qualified and instructed personnel.
- Secure machine against restarting, switch off drives!
- Before starting any work, provide for sufficient space and freedom of movement during assembly.
- Pay attention to tidiness and cleanliness in the assembly area! Loosely stacked or scattered components and tools are accident sources.

If components must be replaced:

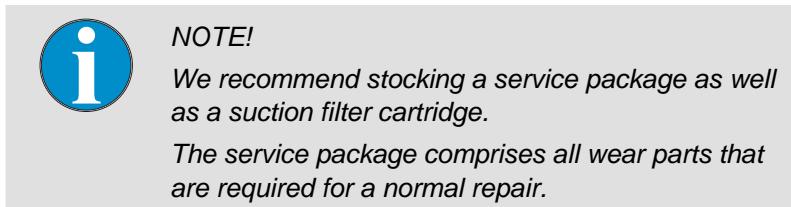
- Pay attention to correct installation of spare parts.
- Properly reassemble all fastening elements.
- Observe screw tightening torques.
- Before restarting, ensure that all covers and protective devices are correctly installed and function correctly.
- After completion of maintenance work and trouble shooting, check correct functioning of safety equipment.

## Technical data

### 3 Technical data

General data	Unit	VacuStar L400
Rated speed / Speed range	[1/min]	1500 / 1000 to 1500
Suction temperature	[°C]	-20...+40
Geodetic height	[m]	0...1000
Oil container contents	[Litres]	4,6
Oil consumption	[ml/h]	85
Weight compressor without accessories	[kg]	76

Table 1: General Data



Operating data compressor vacuum pump at rated speed	Unit	VacuStar L400
Vacuum without cell venting / with cell venting 1)	[mbar]	200 / 100
Final overpressure at the pressure flange <sup>2)</sup>	[bar]	0 to 0.5
Intake volume flow at 400 / 1000 mbar	[m <sup>3</sup> /h]	320 / 345
Power requirement at 400 mbar / 0.5 bar excess pressure	[kW]	7,4 / 10
Sound pressure level (at 7m distance) with 200 mbar / 0.5 bar overpressure	[dB]	70 / 78
Weight compressor with four-way switching valve	[kg]	85

1) Final excess pressure at the pressure flange = 0 bar, suction and ambient temperature = 20 °C

2) Intake pressure at the suction flange = 1 bar, suction and ambient temperature = 20 °C

Table 2: Operating data compressor vacuum pump at rated speed

Operating data compressor at rated speed	Unit	VacuStar L400
Intake pressure	[mbar]	1000
Final overpressure at the pressure flange <sup>1)</sup>	[bar]	0 to 2.0
Intake pressure at 0 / 2.0 bar excess pressure <sup>2)</sup>	[m <sup>3</sup> /h]	345 / 305
Power requirement at 0 / 2.0 bar excess pressure <sup>2)</sup>	[kW]	8 / 19,0
Sound pressure level (at 7 m distance) with 2.0 bar overpressure <sup>2)</sup>	[dB]	77
Weight compressor with mounting flange for suction and pressure line	[kg]	79

1) Suction and ambient temperature = 20 °C

2) at rated speed

Table 3: Operating data compressor at rated speed

**Lubricating oils**

The use of multigrade oils will damage the VacuStar. In that case, the warranty on the part of CVS Engineering GmbH shall cease.

Only single grade oils with the following specification are permitted for operation:

Specification	Value
API	CD/SF or higher
MIL	L2104 C or higher.

*Table 4: Lubricating oil*

**Lubricating oil types**

	Brand	Suction temp. > 10 °C	Suction temp. < 10 °C
ARAL		Basic Turboral SAE 40	Basic Turboral SAE 30
AVIA		Cronos Super SAE 40	Special HDC 30
BP		Vanellus C3-40 Energol C-DG 40	Vanellus C3-30 Energol C-DG 30
ESSO		Essolube XD-3 Motor Oil 40 Essolube X-301 Motor Oil 40	Essolube XD-3 Motor Oil 30 Essolube X-301 Motor Oil 30
FUCHS		Titan Universal HD 40	Titan Universal HD 30
MOBIL		Delvac 1340	Delvac 1330
SHELL		Rimula X Monograde 40	Rimula X Monograde 30

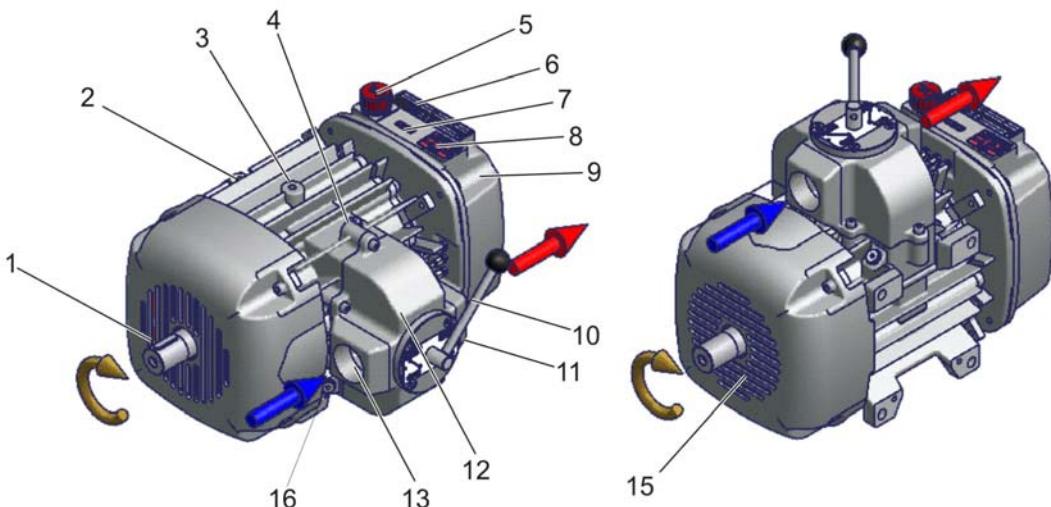
*Table 5: Lubricating oil types*

## Design and function

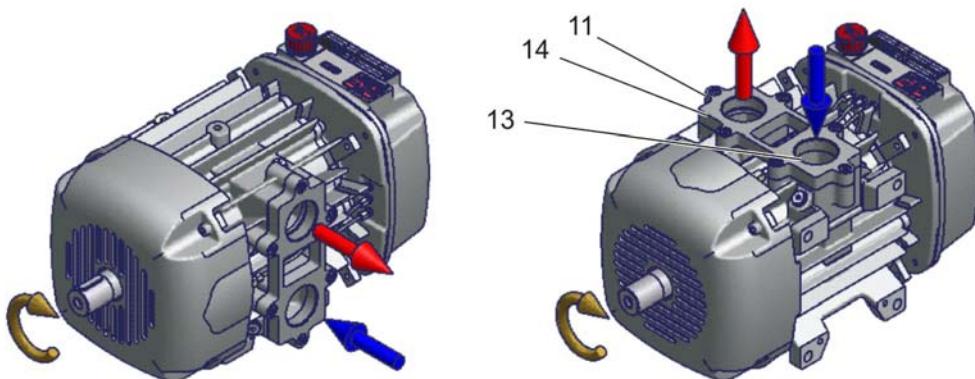
### 4 Design and function

#### 4.1 Design

A:



B:



CVS00522a

Fig. 1: Setup compressor or vacuum pump

**A: Compressor vacuum pump with four-way switching valve**

The position of the switching lever selects the air feed direction (suction or pressure).

**B: Compressor or vacuum pump with mounting flange for suction and pressure line**

1	Drive shaft	10	Switching lever
2	Cell ventilation connection	11	Pressure connection (for illustrated lever setting)
3	Thread for eye bolt	12	Four-way switching valve
4	Temperature and pressure measuring point	13	Suction connection (for illustrated lever setting)
5	Oil filling	14	Mounting flange for lines
6	Rating plate machine	15	Suction opening for cooling air
7	Rotation arrow	16	Connection for measuring control line
8	Rating plate oil		
9	Oil reservoir		

## 4.2 Function

### Functional principle

In the working area of the compressor vacuum pump, rotor vanes in conjunction with the impeller and the casing form cells that are separated from each other and steadily grow (sucking) or shrink (compressing) with each revolution.

### Lubrication

Lubrication is performed by economic lubrication at four points via an oil pump from an oil supply container.

### Cooling

The machine is air-cooled. Heat removal is performed by casing ribs on the lid and casing surface with targeted cooling air guidance, via a ventilation wheel on the drive shaft.

### Drive

The machine is driven by an articulated shaft, hydro motor, V-belt or directly by an elastic coupling.

## 4.3 Control and display elements

Depending on the installation situation, different display elements such as pressure gauge, temperature gauge and negative pressure display are mounted.

## Transport and storage

# 5 Transport and storage

## 5.1 Safety notes for transport

See Chapter 2.6 "Occupational safety and special risks".

### Personal protective equipment

See Chapter 2.5.

## 5.2 Transport

### For future transports:

- Seal all open connections with protective caps (prevents penetration of dirt and water)
- Secure against vibrations
- Securely fasten the machine prior to transport.

## 5.3 Storage

### Storage of packages

Store packages under the following conditions:

- Do not store outdoors.
- Store dry and dust free.
- Do not expose to aggressive media.
- Protect against solar irradiation
- Avoid mechanical vibrations.
- Storage temperature: -10 to +60 °C
- Relative humidity: max. 95%, non-condensing
- If storage lasts longer than 3 months, regularly check the general condition of all parts and of the packaging.
- To keep moisture away from the machine's workspace, bags with desiccant must be placed into the inlets and outlets. These must be removed before start-up.

## 6 Start-up and operation

### 6.1 Safetynotes

See Chapter 2.6 "Occupational safety and special risks".

#### Personal protective equipment

Refer to chapter 2.5

### 6.2 Start-up

#### Inspection prior to initial start-up

Top up **lubricating oil** according to lubricating oil schedule. Fill oil reservoir with oil up to max. 3 cm below filler neck thread.

#### Start-up

- Open present shut-off devices
- Select suction or pressure operation with four-way switching valve in compressor vacuum pump.  
Attention: Switching valve must only be operated in the two end positions. Intermediate positions are not permitted.
- Start the VacuStar drive.
- Adjust speed.
- Check operating data

#### Inspections during operation

The following inspections have to be carried out during operation:

- Prior to every start-up and during operation, the oil level must be checked and topped up if necessary.
- Open shut-off devices.
- Check that the four-way switching valve is in the end position
- Switch on drive and check whether pressure or vacuum are created.
- Pay attention to abnormal noises and leaks during operation. If necessary, switch off machine.
- Drain condensate at the condensate and safety traps. Vessel may not be in a state of vacuum when condensate is drained.

Checking the operating data:

- The speed must range between 1000...1500 min-1.
- Check positive working pressure at the pressure gauge (permissible pressure refer to rating plate).
- Check the operating vacuum at the vacuum meter (permissible vacuum refer to rating plate).
- The compression end temperature at 20 °C suction temperature may not exceed the following values:
  - 150 °C at 400 mbar operating vacuum
  - 120 °C at 0.5 mbar excess pressure

## 6.3 Switching off

Switch the compressors off as follows:

- Switch off drive.
- Close shut-off valves.

## 6.4 Inspections to be performed

### Lubricating oil inspection

Only lubricating oils pursuant to the lubricating oil tab: 5 are permitted.

Check oil level at the inspection glass and if necessary, fill with oil to approx.

3 cm below the filler neck thread. The oil level may not drop below the bottom mark on the oil inspection glass.

### Non-return valve

The non-return valve is maintenance free, but is subject to wear like any other moving part. We recommend a visual inspection every 3 months. In this connection, the non-return valve must be dismantled, cleaned, freed of deposits and checked for freedom of motion.

### Safety valve

**The safety valve is no regulating device!**

**The operational capability must be checked on start-up and later at weekly intervals.**

The safety valve must be secured against maladjustment. Blocking or manipulating the safety valve can have penal consequences if it gives rise to an accident. Any warranty claims shall also be forfeited in such a case.

The nominal opening pressure may not exceed the maximum permissible final overpressure (refer to rating plate) or the permissible system pressure, provided the latter is lower.

Functional testing is carried out by actuating the manual ventilation with the machine running.

### Inspection of the ventilating valve

As a matter of principle, a ventilating valve must be installed as safety element on the vacuum pump's suction side. When the set vacuum is reached, the ventilating valve opens and admits atmospheric auxiliary air into the system. The operational capability must be checked weekly with the aid of a vacuum meter at the VacuStar's inlet. In case of systems without cell ventilation, the vacuum may not drop below the permissible value of 200 mbar.

In case of systems with cell ventilation, the vacuum may not drop below the permissible value of 100 mbar.

### Inspection of cell ventilation

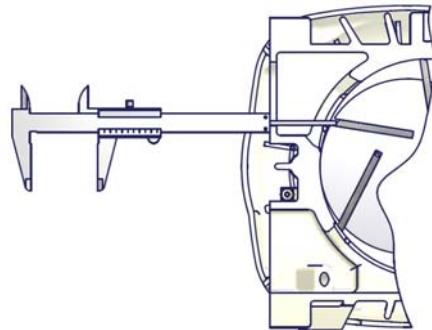
When the cell ventilation is connected, the VacuStar can be operated at a vacuum of up to 100 mbar. A suction filter is located in the cell ventilation line. The filter must be cleaned weekly and replaced in case of visible damage.

**Height wear rotor vanes**

Based on a daily runtime of 3 to 4 hours, the initial inspection should be performed after approx. 6 months. For further inspections, see page 25, Table 6 "Maintenance schedule".

**Measuring height wear**

1. Disassemble four-way switching valve or mounting flange.
2. Check vane recess with sliding calliper. The rotor vanes must be replaced at a recess of more than 5 mm.



*Fig. 2: Measuring of rotor vane height wear*

## Maintenance

# 7 Maintenance

## 7.1 Safety during maintenance work

See Chapter 2.6 "Occupational safety and special risks".

**Personal protective equipment** See Chapter 2.5.

**Environmental protection** Observe the following information with regard to environmental protection during maintenance:

- Collect exchanged oil in suitable containers and dispose of in accordance with valid local regulations.

## 7.2 Maintenance schedule

The following describes the maintenance work that is necessary for an optimum, trouble-free operation. Maintenance intervals must be observed.

If increased wear of individual components or functional groups is determined during regular inspections, the operator has to reduce the required maintenance intervals on the basis of the actual signs of wear.

Changes compared to normal operation (increased power consumption, temperatures, vibrations, noises, etc. or response of monitoring systems) lead to the assumption that the functions are impaired. These then have to be subjected to an inspection by specialised staff.

In case of queries regarding the maintenance work and intervals: contact the manufacturer (service address → page 2).

For maintenance schedule refer to next page.

**Maintenance schedule**

Interval	Maintenance work	To be carried out by
Every 15 minutes	Check operating speed	Operator
	Check operating pressure / vacuum	
	Check air outlet temperature	
Daily	Check condensate	Operator
	Check safety trap	
	Check silencer	
	Check oil level and top up with fresh oil if necessary	
Weekly	Check safety valve	Operator
	Check ventilating valve	
	Clean compressor / vacuum pump	
	Clean vacuum filter	
	Check V-belt, V-belt tension and re-tension if necessary	
Monthly	Clean cell ventilation filter, replace if damaged	Operator
	Clean oil tank	
	Check fastening screws and tighten if necessary	
quarterly	Check shaft sealing rings for tightness (no oil may leak from them)	Specialised staff
	Check rotor vane wear (replace vane at more than 5 cm)	
	Check cell ventilation valve	
Half-yearly	Check non-return valve of VacuStar	Specialised staff
5,000 oh / 3 years	Replace shaft sealing rings	Specialised staff
10,000 oh / 5 years	Replace bearings	Specialised staff

Table 6: Maintenance schedule

### 7.3 Performance of maintenance work

<b>Cleaning the VacuStar</b>	Observe the following when cleaning the compressor: <ol style="list-style-type: none"> <li>1. Switch off compressor and secure against restarting.</li> <li>2. Remove soiling. Do not use aggressive cleaning agents.               <ul style="list-style-type: none"> <li>■ No water may penetrate the compressor. Caution when using a high-pressure cleaner.</li> </ul> </li> <li>3. After wet cleaning, warm up the compressor for a few minutes.</li> </ol>
<b>Compressor cooling</b>	To warrant best cooling, the protective grid apertures must be free of deposits.

## Maintenance

### Suction air filter

The contamination state is usually indicated by a maintenance display. If maintenance is required, open filter casing and replace filter cartridge.

### Action after lengthy standstill

During a lengthier standstill, we recommend to put the compressor into operation every 4 weeks for approx. 15 minutes.

### Action after sucking over of foreign matter

Proceed as follows if dirt or liquid is sucked on:

- Unscrew the locking screw in the inlet.
- Operate VacuStar without vacuum and counter pressure.
- Switch on machine and allow approx. 0.5...1 l of a diesel-oil-mixture (1:1 mixing ratio) to be sucked into the machine through the hole in the inlet at approx. 1000 rpm.
- Afterwards, allow another 0.2 - 0.5 l clean oil to be sucked in via the inlet.
- Completely remove the diesel-oil-mixture from the machine and the downstream silencer again - fire hazard!

Switch off machine and re-attach locking screw. VacuStar pursuant to chapter Lubricating oil inspection

## 8 Malfunctions

This chapter describes possible causes of malfunctions and trouble shooting tasks.

Reduce the maintenance intervals if similar malfunctions occur repeatedly due to above-average intensive use so intervals correspond to the actual load.

Contact the manufacturer in case of malfunctions that cannot be repaired with the aid of the following information (→ p. 2)!

### 8.1 Safety

See Chapter 2.6 "Occupational safety and special risks".

#### Personnel

- The trouble shooting work described at this point can be carried out by the operator, unless otherwise indicated.
- Some work may only be carried out by specially trained specialised staff or exclusively by the manufacturer himself. This is specifically pointed out in the description of the individual malfunctions.
- Only electrical specialists may carry out work on the electrical system.
- Components and parts may only be replaced by specialised staff.

#### Personal protective equipment

See Chapter 2.5.

#### Environmental protection

See Chapter 7.1.

#### Conduct in the case of malfunctions

The following basically applies:

1. Immediately switch off the compressor in case of malfunctions representing an immediate danger for individuals or material assets.
2. Switch off all power supplies and secure against restarting.
3. Inform person in charge at the place of installation.
4. Depending on the type of interference, have the cause determined and removed by the relevant, authorised specialists

### 8.2 Recommissioning after corrective action

After corrective action or trouble shooting:

1. Ensure that nobody is staying in the hazard area.
2. Start in accordance with the instructions in chapter „Start-up“.

## Malfunctions

### 8.3 Malfunction table

Malfunction:	Possible cause	Corrective action	Execution
VacuStar's delivery rate decreases.	Vacuum filter soiled	Clean vacuum filter	Operator
	Leaky suction line / fittings	Look for leaky spots and eliminate leak	Specialised staff
	Speed too low	Adjust speed	Operator
	Wear of rotor vanes, possibly caused by dirt or liquids that have gotten into the machine (sucking over of foreign matter)	Replace rotor vane, remove dirt and have machine overhauled at an authorised workshop	Specialised staff
Unnormal noise development	Machine is out of alignment	Align machine accurately	Specialised staff
	Bearing defective	Replace bearing (or have it replaced)	
	Lack of lubricating oil	Top up oil, clean oil reservoir and suction filter	Operator
	Unsuitable lubricating oil	Fill in oil according to lubrication schedule	Operator
	Rotor vanes are jammed	Check rotor vanes	Specialised staff
	Casing bore shows grooves or corrugations due to the aspiration of dirt	Have casing bore re-turned and honed at an authorised workshop. In case of heavily soiled intake air, install fine filter	Specialised staff
	Wrong speed	Maintain speed range	Operator
	Changed pressure	Maintain nominal pressure	Operator
	Changed vacuum	Maintain nominal vacuum, check exhaust system and clean if necessary	Operator
	Non-return valve rattles	Check non-return valve	Specialised staff
	Foreign matter in the machine	Remove foreign matter. Rinse out machine.	Specialised staff
	Slide breakage	Switch off machine immediately and repair	Specialised staff
Compressed air temperature too high	End pressure too high	Maintain nominal pressure	Operator
	Exhaust silencer clogged	Replace exhaust silencer	Specialised staff
	Four way switching valve in wrong position	Correctly adjust four way cock	Operator
	Non-return valve is stuck	Check non-return valve and clean if necessary	Specialised staff
	Vacuum filter clogged	Clean vacuum filter	Operator
	Vacuum too high	Maintain nominal vacuum	Operator

## Malfunctions

Malfunction:	Possible cause	Corrective action	Execution
<b>Operating pressure or operating vacuum is not obtained</b>	Pressure gauge or vacuum meter do not indicate correctly	Replace pressure gauge or vacuum meter	Specialised staff
	V-belts are slipping	Check V-belt tension and re-tension if necessary	Operator
	Four way switching valve in wrong position	Correctly adjust four way cock	Operator
	Condensate drain cock open	Close condensate drain cock	Operator
<b>Silt or liquid has gotten into the machine</b>	Foreign matter has been sucked over into the machine	Rinse thoroughly with diesel-oil-mixture at lowest permissible speed and without pressure or vacuum, afterwards add lubricating oil according to chapter Lubricating oil inspection page 30.	Operator
<b>Power requirement too high</b>	Speed too high	Maintain speed limit	Operator
	End pressure too high	Maintain nominal pressure, actuate / check safety valve	Operator
	Pressure gauge indicates incorrectly	Replace pressure gauge	Operator
	Exhaust silencer clogged	Replace exhaust silencer	Specialised staff
<b>Lack of lubricating oil despite full oil tank</b>	Oil intake strainer in oil tank clogged	Clean oil tank and intake strainer, check oil lines	Operator
<b>Safety valve blows off</b>	Closed valves in the pressure line	Open valves	Operator
	Clogging in pressure system	Eliminate clogging	Operator
	Exhaust silencer clogged	Replace exhaust silencer	Specialised staff
<b>Ventilating valve responds</b>	Closed valves in the suction line	Open valves	Operator
	Suction filter clogged	Clean suction filter, if necessary replace filter cartridge	Operator
<b>Compressed air blows off at shaft end and oil is leaking</b>	Sealing parts are damaged	Replace radial shaft sealing rings in sealing cover	Specialised staff
<b>Rubber smell (at V-belt drive)</b>	V-belts slip due to insufficient belt tension	Check belt tension, re-tension if necessary	Operator
	End pressure too high	Maintain nominal pressure	Operator

Table 7: Malfunction table

## 9 Spare parts

We recommend stocking a service package as well as a suction filter cartridge.

The service package comprises all wear parts that are required for a normal repair.

### **Customer Service**

In case of queries regarding the product, spare part orders, repairs, replacement machines and dispatch of fitters, please contact our customer service: Phone: +49 (0)7623 71741-31

## 10 Decommissioning and disposal

A compressor that is no longer usable should not be recycled as complete unit, but disassembled into individual components and recycled according to material types. Non-recyclable materials have to be disposed of in an environmentally compatible manner.

- Prior to decommissioning and disposal of the machine, it must be completely separated from the surrounding units.
- The disassembly and disposal of the machine may only be carried out by specialised staff.
- The machine has to be disposed of in accordance with the respective country-specific regulations.

## Index

### A

Acceptance ..... 8

### C

Cleaning

  compressor ..... 24

Components, moving ..... 12

Compressed air ..... 12

Contact person ..... 7

Cooling ..... 18

Copyright protection ..... 6

Customer Service ..... 7

### D

Danger of burns ..... 10

Danger pictogram ..... 10

Danger pictograms ..... 10

Dangers ..... 10

Design ..... 17

Display elements ..... 18

Disposal ..... 29

Drive ..... 18

### E

Environmental protection ..... 23, 26

### F

Function ..... 18

### I

Improper operation ..... 11

Inspection

  during operation ..... 20

  non-return valve ..... 21

  rotor vanes ..... 22

  safety valve ..... 21

  ventilating valve ..... 21

Inspection

  prior to initial start-up ..... 20

Instructions ..... 9

Intended use ..... 8

### L

Lengthy standstill ..... 24, 25

Liability ..... 6

lubricating oil ..... 16

Lubricating oil types ..... 16

Lubrication ..... 18

### M

Maintenance ..... 23

Maintenance ..... 14

Maintenance schedule ..... 23

Maintenance work ..... 24

Malfunction table ..... 27

Malfunctions ..... 26

### O

Occupational safety ..... 10

Operating elements ..... 18

Operating instructions ..... 4

Operating personnel ..... 9

Operation ..... 13, 20

Operator ..... 8

### P

Personnel

  Trouble shooting ..... 26

Pneumatics ..... 12

Protective equipment ..... 9, 19, 20, 23, 26

### R

Recommissioning ..... 26

### S

Safety ..... 8, 26

Safety notes ..... 19, 20, 23

Signposting ..... 12

Spare parts ..... 7, 29

Specialised staff ..... 9

Start-up ..... 13, 20

Storage ..... 19

Suction air filter ..... 25

Switching off ..... 21

Symbols in the instructions ..... 5

## Index

<b>T</b>	Trouble shooting .....	14
Technical data.....	15	
Transport.....	13, 19	
<b>W</b>		
Warranty.....	6, 7	

